

*Vaccination
Paper
II.*



FACTS ABOUT SMALLPOX

AND

VACCINATION



REVISED EDITION.

LONDON: THE BRITISH MEDICAL ASSOCIATION.

1924.

Price Sixpence.



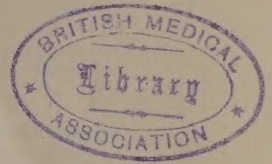
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NOTE.

IN re-editing the British Medical Association's pamphlet I have made much use of material already published. The object is to present in convenient form illustrations of the more striking groups of facts proving the value of vaccination, to comment on allegations which have been made in its disparagement, and to discuss the position of smallpox and its prevention in this country at the present time. The data are from many sources, most of which are listed in a bibliographical appendix. The author's own writings have been largely drawn on, in some passages without verbal alteration.

October, 1924.

JOHN C. McVAIL.

FACTS ABOUT SMALLPOX

AND

VACCINATION.



INTRODUCTORY.

Since the British Medical Association's pamphlet "Facts about Smallpox and Vaccination" was last revised by me in 1905, the problem of smallpox and its prevention by vaccination has changed in various particulars, some of them important.

Smallpox.—The severe type of variola which prevailed in Jenner's day and for centuries previously, attained its highest fatality of modern times in the pandemic of 1870-73. An epidemic which came twenty years later was much less fatal, and in the first years of the present century the fatality was still lower in the provinces, though in London there was reversion to a case mortality rate (but not to a prevalence) making some approach to that of the great epidemic of the seventies.

From 1905-6 to 1917 this country enjoyed quite an unparalleled freedom not only from smallpox mortality, but also from smallpox morbidity. The annual notifications from 1911 to 1917 inclusive were only 289, 121, 113, 65, 93, 159 and 7. That unfortunately turned out to be low water mark, and subsequently there has been rapid recrudescence of the disease (see p. 29), though up till now (1924) happily of an extraordinarily mild type, deaths being almost absent.

Smallpox in its severe or classical form reaches this country, and especially London, from the continent of Europe, which in its turn receives the infection from northern Africa and the East.

The attenuated strain of recent years has been experienced also in Australia; South Africa, Cuba, Trinidad, the United States and Canada. Various names have been applied to it in various places and circumstances—amaas, alastrim, Cuban itch, Kaffir-pox—but it is most safely designated simply as mild smallpox. Owing to abundant intercourse, it comes to us mainly from North America, where in some parts of the United States it seems to have become practically endemic, as, under present conditions, may quite conceivably become the case in Britain. On the one hand the disease may be overlooked by parents, and is not always easily diagnosed by doctors, so there is much opportunity for spread of infection. On the other hand, its inherent infectivity corresponding broadly to the amount of the eruption, is very low, so that it does not spread nearly so rapidly as classical smallpox, which itself is by no means always recognised domestically or even medically. The black or hæmorrhagic type, the worst of all, may readily be mistaken for some non-infectious malady.

An important question is whether mild smallpox can be relied on to remain mild. Cases are by no means uniformly so, but the disease as a rule breeds true.

Yet it is thought that the type may change. The U.S. Federal Government's Public Health Service, Washington recently* called attention to "Increasing Virulence of Smallpox in the United States." The numbers of cases had diminished, but the fatality rate in a total of 275 cities increased from 0.6 per cent. in 1920 to 1.1 per cent. in 1921, and 5.5. per cent. in 1922. Statistics are given for ten "special cities" in which the case mortality was 0.2 per cent. in 1920, 8.5 in 1921, and 28.4 in 1922. Kansas City had 2 deaths in 600 cases in 1920; 175 deaths in 1,186 cases in 1921; and 96 deaths in 214 cases in 1922. Denver had one death in 953 cases in 1920; 37 deaths in 924 cases in 1921; and 248 deaths in 793 cases in 1922. In the two cities jointly one case in three proved fatal in 1922. The source of infection was unknown, but may have been the same in both cities.

On analysis, however, I find that the increased virulence in the 275 cities (of which 29 are in Canada) was due to the occurrence of the severe type in a few of the cities, and not to any general increase of severity in the mild type. If the ten "special cities" be excluded the other 265 had only 18 deaths in 7,092 cases in 1922. In Ontario a very virulent type of smallpox has manifested itself in the present year, 1924, as reported at p. 30.

Vaccination.—The position with regard to the practice of vaccination has also changed since the last edition of this pamphlet. The Vaccination Act of 1898 provided for the systematic supply of calf lymph for domiciliary instead of stationary vaccination of infants, and also for exemption on the ground of conscientious objection. The Act was followed by appreciable increase in infant vaccination. But the exemption clause as administered by some magistrates, including, I regret to say, an occasional medical magistrate, was defective. The magistrate had in every case to be "satisfied" of the existence of conscientious objection. No one could compel such satisfaction and refusals to grant certificates helped to bring in the law of 1907, which, as administered, has made exemption very easily obtainable. Before 1907 the decline already referred to had begun in smallpox prevalence and especially in smallpox mortality. These causes combined have resulted in steadily decreasing vaccination of infants, so that in 1921 the percentage of vaccinations to births fell to 38.3. In 1922—the latest year for which figures are available—it was 40.3.† On the other hand vaccination and revaccination in the Army and Navy during the war, though not compulsory, have in fact added greatly to the protection of the adult male population of the country, and the employment of women in war service has had, incidentally, a similar effect. As regards the young the recent recrudescence of smallpox even of the mildest type in many parts of England, has resulted in appreciable resort to vaccination in the localities affected and to some degree outside of these localities. In some places, however, invasion of mild smallpox has not led to general vaccination, and the disease has not been stamped out.

In the concluding part of this pamphlet I shall revert to the vaccination law, but will proceed now to state the case for vaccination as the preventive of smallpox.

This country having been practically free from epidemic smallpox for almost twenty years up to 1921, and infant vaccination having been less and less resorted to in the absence of the disease which it is performed to prevent, statistics illustrative of the value of vaccination have to be taken mainly from earlier years.

* *Weekly Public Health Reports*, Vol. 38, No. 25, June 22nd, 1923

† This figure is for England and Wales. In Scotland the percentage is considerably higher—62.10 for 1922.

In March, 1923, at the request, and under the chairmanship of the Minister of Health, I addressed a meeting of members of the House of Commons on the subject of smallpox and vaccination.* In doing so, I submitted and endeavoured to support very briefly four propositions as follows: (1) Smallpox is worth preventing; (2) Smallpox can be prevented by vaccination; (3) Smallpox cannot be prevented without vaccination, and (4) Properly conducted vaccination is very safe. The propositions are simple and inclusive, so I propose to treat the subject under the same headings now, but more fully than in the address.

I. SMALLPOX IS WORTH PREVENTING.

To realise what smallpox was, it is necessary to go back to pre-vaccination times.

(1) Smallpox Mortality.

Bernouilli, the famous mathematician, calculated that no fewer than 15,000,000 of human beings in the eighteenth century died of smallpox every 25 years. Süssmilch, an eminent statistician of the time of Frederick II., estimated that nearly everyone had smallpox, and that it carried off a twelfth part of mankind. In London, in 1660-79 (long before the days of smallpox inoculation), of every 80,000 deaths, 4,170 were from smallpox. In Iceland, in 1707-9, it killed 18,000 persons in a population of 50,000. In Glasgow, a large and very insanitary town, of 31,088 deaths or burials in 1783-1800 from all causes, 5,959 were due to smallpox. Chester, which on the other hand was described by Dr. Haygarth as a town of "almost incredible healthiness," had fewer than 15,000 inhabitants, and contained in the year 1775 only 1,060 persons, or one in 14, who had not had smallpox. In Kilmarnock, with 4,000 to 5,000 inhabitants, of every 1,000 children born alive in 1728-64, 161 died of smallpox. In the village of Ware, in Hertfordshire, as recorded in the Royal Society's volume of manuscript papers on Inoculation, there was a smallpox epidemic in 1722, with 72 deaths. The remaining population was 2,515, and was classified thus in relation to the epidemic: "Had the smallpox before, 1,601"; next, "Had the smallpox this time, 612"; and finally, completing the population, "To have the smallpox, 302." That accounts for the whole population of Ware. Such was the educated opinion of the time as to the inevitability of the disease.

(2) Age Incidence of Smallpox.

In pre-vaccination times, smallpox was a disease of childhood, just as measles and whooping cough were then, and still are. This was due to the fact that few children escaped attack by smallpox before they reached five or ten years of age. Those who recovered had subsequently the protection afforded by smallpox against future attack. Very many of the survivors were disfigured by the disease and some had lost their sight; but protection by smallpox attack was usually, though not invariably, lifelong.

In Geneva, in the period 1580-1760, during which there were 25,349 smallpox deaths, 961 of every 1,000 were under 10 years of age.

* The Address was published in the issue for October, 1923, of the Research Defence Society's quarterly magazine, "The Fight against Disease," Macmillan & Co., Ltd.

In Chester (that town of "almost incredible healthiness") every one of 202 fatal cases in 1774 was under 10 years old, and a quarter of them were under one year. In Kilmarnock, in 1728-64, of every 1,000 smallpox deaths, 988 were under 10 years of age, and in Edinburgh, in 1764-83 the proportion was 993 per 1,000. In a total of 36,755 deaths from smallpox at all ages occurring in Kilmarnock, Edinburgh, Manchester, Warrington, Chester, Geneva, and the Hague in various prevaccination periods from 1580 onwards, 17,252 were under two years of age.

Kilmarnock. Forty years ago I made examination of an old Register of Deaths in Kilmarnock belonging to the 36 years 1728-1764, and, though the tale has been told more than once it may be repeated here, as such Registers are very rare.

Kilmarnock had a population of probably about 4,500. In the 36 years nine epidemics of smallpox took place. The disease thus came pretty regularly about once in every 4 years. If one epidemic were a little late the next would be a little early. The register deals only with deaths not with cases, and on opening the pages of the old volume, in any of the epidemic years it is startling to find the entry smallpox, smallpox, smallpox, in line after line.

The deaths from all causes in the 36 years were 3,860, and the smallpox deaths were 622, or 16 per cent. of the total. That was not for epidemic years, but for the whole period of the Register. In seven of the nine epidemics the total deaths were considerably more numerous than the births. The smallpox deaths in each epidemic averaged 69, and ranged from 45 to 95. But the most striking fact of all relates to the ages of those who died from smallpox. If the number of births between the apex of one epidemic and that of the next be noted, and if deduction be made of the deaths from other causes between the two epidemics, it is found that when the new visitation came there was an average of 475 babies and little children who had been born since the last outbreak. To close on nine-tenths of its extent the new epidemic had to find its victims amongst that community of little children. The average age at death was 2.6 years—a little over 2½. Of those who died only ten per cent. had been born before the last previous visitation, and only one per cent. had passed through more than one outbreak. In the 36 years only three smallpox deaths occurred over 20 years of age, and the oldest victim was a man of 26. In respect of smallpox there were indeed, three Kilmarnocks. One consisted of the population living over four or five years of age. These were now protected against smallpox; they had already battled with and overcome the disease fiend. Many would be disfigured; some would have suffered from injury or loss of sight; some would be afflicted in various ways by the sequelæ of the disease, but they were practically safe from future attack. The second Kilmarnock lay under the greensward of the kirkyard. These had been in the same battles with smallpox, but had lost their lives and were at rest. The third Kilmarnock was that community of little children who had been born since the last visit of the pestilence. Within 4 or 5 years of birth they had to meet and fight the most terrible physical foe they would ever encounter.

Such was smallpox before the days of vaccination.

Mild smallpox was also well-known in pre-vaccination times, but in presence of the severe form it receives little notice from writers on the subject. Even mild smallpox, however, apart from the risk of its becoming severe, is well worth preventing, and it is most undesirable that what would amount to a new endemic

disease should be established in this country as in part of the United States. No doubt among those attacked it would give a large measure of protection against subsequent smallpox of the severe type. But the cost would include besides some deaths, and some proportion of disfigurement and other sequelæ of attack, a large aggregate of illness and temporary incapacity, whilst for the community it would involve heavy outlay for hospital isolation, maintenance and nursing, search for and control of contacts, together with whatever dislocation and loss of trade, and interference with business in general might result from the public alarm which smallpox usually creates. If there were no alternative all this burden would have to be borne and the price paid would be much less than was exacted by smallpox inoculation before the days of Jenner. But there is an alternative, efficacious alike against mild and severe smallpox. That alternative has now to engage our attention.

II. SMALLPOX CAN BE PREVENTED BY VACCINATION.

The evidence of the power of vaccination over smallpox is probably as great as, if not greater than, can be adduced in support of any proposition outside the domain of the exact sciences. Indeed, when all the variabilities of the human body which is the subject of protection, and the possible variations in the power and activity of the protecting agency are taken into account, the proof of the value of vaccination, both in volume and in completeness, is very remarkable. One of its most striking features is the convergence of different lines of evidence towards the one conclusion. From whatever starting-place the subject be approached the point reached is the same. In whatever manner any sufficient body of facts is questioned and cross-questioned, the reply is unequivocal and unvarying.

(1) The Mortality from Smallpox is much less now than in Pre-Vaccination Times.

That in itself proves nothing as various other diseases have greatly diminished, but when diminution is considered in relation to vaccination in places, times, classes, institutions, etc., the causal connexion becomes manifest, especially as some neglect of vaccination commonly clinches the argument by providing a crucial control observation.

In the first quarter of the 19th century, after introduction of vaccination, there was a great fall in smallpox mortality. This could not be attributed to decrease in smallpox inoculation, because it occurred in Sweden also, where inoculation had not been the practice, and in our own country the Royal Commission found it impossible to conclude that inoculation had done more to spread smallpox by infection than to prevent it by protecting the inoculated. It is true that at the period in question vaccination spread only gradually, but only a minority of the people required vaccination, the majority having already had smallpox either in the natural way or by inoculation.

(2) Where Infant Vaccination has been practised the Greatest Diminution in Smallpox Mortality has been in the Early Years of Life.

It has been shown above that in places for which statistics exist, previous to the vaccination era, about 90 per cent. or more of smallpox deaths, were in children under ten years old.

In modern times, on the other hand, vaccination being performed in infancy, and having its greatest protective influence in the earlier years of life, smallpox has to a great extent departed from childhood and transferred itself to later and less protected ages.

The Royal Commission showed that the cases of smallpox under five years old, including all the unvaccinated, ranged from 312 per 1,000 cases in 1870-4 to 193 in 1885-9 and 283 in 1890-4, this rise in the last quinquennium being related to increasing neglect of vaccination.

In London, in 1884, of 1,000 smallpox deaths, 343 were under ten years old. But this calculation includes both vaccinated and unvaccinated persons. In the vaccinated community the corresponding figures were not 343, but 86; and in the unvaccinated, not 343, but 612. Vaccination, by lessening the opportunities for infection, and increasing the intervals between epidemics, helped even the unvaccinated. Yet among the unvaccinated smallpox is still, to a great extent, a disease of childhood, though the comparative absence of smallpox in recent years in this country will naturally affect the age incidence when the disease occurs.

It has already been noted that in prevaccination times, smallpox, measles, and whooping cough were diseases of childhood. Measles and whooping cough are still diseases of childhood, but smallpox, and especially fatal smallpox, has been to a very remarkable extent driven from vaccinated childhood by means of vaccination. What still remains can be driven from later periods of life by means of revaccination.

(3) Relation of Vaccination and Smallpox in Nations.

In countries where there is much vaccination and revaccination relatively to the population, there is little smallpox.

In Germany, both vaccination and revaccination are required, and smallpox mortality has been almost abolished.* Beginning with the year 1816, it is found that in Prussia, previous to the German law of 1874, the smallpox death-rate was 309 per annum per million of population. The following comparison was made by Dr. E. J. Edwardes in his little book, "Smallpox and Vaccination in Europe":—

Smallpox Deaths per Million of Population.

PRUSSIA.

Before 1874 (1866-74).—620, 432, 188, 194, 175, 2,432, 2,624, 357, 95.
After 1874 (1875-85).—36, 31, 3, 7, 13, 26, 36, 36, 20, 14, 14.
(1886-98).—5, 5, 3, 5, 1, 1, 3, 4, 3, 0.8, 0.2, 0.2, 0.4.

GERMAN EMPIRE (average population 52,000,000).

1886-99.—4, 3.5, 2.3, 4.1, 1.2, 1.0, 2.1, 3.1, 1.7, 0.5, 0.2, 0.1, 0.3, 0.5.

In ill-vaccinated Austria on the other hand, the smallpox deaths per million were:—

1887-96.—440, 640, 520, 250, 290, 260, 250, 110, 47, 35.

*As regards the German vaccination laws, see "Smallpox and Vaccination in Europe," by Edward J. Edwardes, and an article by him in the *Practitioner*, May 1896; also the translation of the German Vaccination Law, published in the *British Medical Journal*, Sept. 23, 1899, page 789. See also p. 12 concerning "compulsory" vaccination.

In the fifteen years 1895 to 1909 inclusive, the smallpox deaths in the German Empire (population, 1910 Census, 64,903,423) were 790, whilst in England and Wales (population 1911 Census, 36,075,269), they were 6,478.

Moreover, in Germany the vaccination age is the second year of life, and in 1886-90 fully two-fifths of the few deaths that occurred from smallpox were under two years of age. Also most of the cases commonly occur near the frontiers of badly vaccinated countries.

Germany's neighbour, Austria, in the twenty years following 1874, had 239,800 deaths from smallpox or almost thirty times more than Germany, and Russia, another neighbour, lost in its European population of 60 or 70 millions, an average of 38,833 persons by year from smallpox.

The recent position in Germany is interesting. Smallpox from ill-vaccinated Russia never seriously succeeded in penetrating into the interior of Germany where the population, even any who were in some degree susceptible to smallpox, were protected from infection because they were living in a vaccinated and re-vaccinated nation. During the war however, enormous crowds of Russian prisoners were interned in Germany and smallpox had an opportunity such as never came to it before, of searching out those who had by any chance remained or become susceptible to its attack. The result was that the disease attained quite appreciable prevalence. In the six years 1917-1922 inclusive there were in this empire of about sixty million inhabitants nearly 11,000 cases of smallpox, or about 1,000 more than occurred in the four million population of London in the two epidemic years 1901-2. As another measure of comparative prevalence it may be stated that Germany in six years under the influence of war and with ill-vaccinated nations on its borders, had one case of small-pox in 5,500 of its population, while Leicester in its epidemic 1902-3, though surrounded by a population under systematic infant vaccination, had in twenty months one notified case of smallpox in every 308 of its population. And if note be taken of the absence of smallpox from Leicester in other years, as from the rest of the Midlands of England, so note must be taken of its absence from Germany, notwithstanding its exposure to infection from adjoining countries.

Whether the German figures included any Russian and other aliens, I do not know. Fully 3,000 of the cases were in 1917, and well over 6,000 in the two years 1919-20. The fatality rate in the four years 1917-20 was 15.6 per cent.* Notwithstanding this outbreak the long protection of Germany by its systematic vaccination and re-vaccination is very striking testimony to the value of the prophylactic.

A curious attempt has been made from time to time to discredit Germany's evidence by asserting that vaccination had been compulsory in Germany since 1835. This statement was made by an English anti-vaccinationist so long ago as 1886, and has been reverted to recently by way of a parliamentary question regarding a reference to the Act of 1874 in the admirable tract of the Ministry of Health entitled "Smallpox and Vaccination." Needless to say it received immediate contradiction. In the Prussian Army, however, vaccination was required from 1834, and the value of that precaution became manifest in the Franco-Prussian War.

In Belgium vaccination was not "compulsory," and in 1875-84, it had a rate of 441 per million as compared with Prussia's 22 in the same period. At the

*Parliamentary question and answer, 26th June, 1923.

time of the European epidemic of 1870-75 Scotland, England, Sweden, and Bavaria had a so-called "compulsory" vaccination law, and their smallpox rates per million in the worst years were 1,470, 1,830, 1,660, and 1,660 respectively. Prussia, Holland, and Austria had no such law, and their rates in the worst years were 5,060, 5,490, and 6,180. Coming to 1877-86, with vaccination not required in Austria, with only infantile vaccination required in England, and with vaccination and revaccination required in Prussia, the average death-rate per million from smallpox in the capitals of these three countries was in Vienna 670, in London 250, and in Berlin 10.* In London the rate would have been less, but for the disease spreading from the smallpox hospitals that it then contained, and it has been very much less since the hospitals were removed.

In Rosenau's important work on Preventive Medicine and Hygiene† there is given a comparison between countries where the law has imposed some obligation towards vaccination, and others without equal pressure. The period covered is only four years, 1886-9 inclusive, which is too short for a sound conclusion without other evidence, but other evidence is abundant and the figures for these years are given as follows:—The first group of countries consists of (a) Sweden, (b) Ireland, (c) Scotland, (d) Germany, and (e) England. In these the average deaths per million of population were (a) 1; (b) 1; (c) 3; (d) 3.5; and (e) 16. The second group consisted of (a) Switzerland, (b) Belgium, (c) Russia, (d) Austria, (e) Italy, and (f) Spain. Their average smallpox deaths per million of population were (a) 18.5; (b) 164; (c) 231; (d) 510; (e) 536; and (f) 963.

Smallpox and Vaccination in the Philippines.—A favourite statement of opponents of vaccination within the past three or four years has been that vaccination has failed to prevent smallpox in the Philippines. I have discussed the facts in the *British Medical Journal* of Jan. 27th and Sept. 8th, 1923,‡ and to these articles the reader is referred. The Philippines Reports as issued are difficult to follow, but the main facts appear to be that:—(1) Much of the vaccine used was worthless owing to atmospheric temperature, defective preservation and difficulties of transit. (2) The work of vaccination, whether under the United States, or subsequently under Filipino authorities, had to be left to natives, uneducated, incompetent and untrustworthy. (3) Much vaccine, whatever its worth, was thrown away by the "vaccinators," who, however, sent in returns of its having been duly used. (4) Not nearly all vaccinations were subsequently inspected as to results. (5) Not nearly all of those inspected were found to have "taken." (6) Fatality rates as reported are vitiated by "varioid" being entered as a disease separately from "variola." (7) Some of the statistics are frankly unbelievable, such as that in one outbreak there were 180 cases and 180 deaths, and that all these were either in "infants" or "adults," no other age class being mentioned.

In short, these Philippines Reports may for purposes of evidence as to vaccination, be put aside as worthless.

(4) In Classes among which there is much Vaccination and Revaccination there is little Smallpox.

Smallpox Nurses.—No persons are so terribly exposed to infectious diseases as the nurses in fever and smallpox hospitals.

* *Practitioner*, May, 1896.

† Fourth Edition, D. Appleton & Coy., New York, 1923.

‡ Also August 16th, 1924.

As regards fever nurses, Dr. Collie, Medical Superintendent of Homerton Hospital, declared that "the only way in which nurses become seasoned against fever is by taking the disease." At Homerton, Stockwell, and Liverpool Road Fever Hospitals, in the ten years ending 1881, 133 of the staff were attacked by various fevers, and 25 died. The Gateshead Medical Officer wrote regarding the time when typhus was common: "Every nurse who has been more than a fortnight in the typhus wards has suffered from typhus." In Newcastle in 1882 only 5 out of 14 nurses escaped typhus, and among the 9 attacks there were two deaths. In the Hospitals of the Metropolitan Asylums Board, in 1887-95, no fewer than 704 of the attendants contracted scarlet fever, diphtheria, or enteric fever.

Dr. E. W. Goodall told the Epidermological Society in 1900 that in these hospitals in the eight years 1892-99 inclusive, for every 1,000 cases of Enteric Fever, 16 persons on the staff contracted that disease, and the corresponding figures for Scarlet Fever and Diphtheria were 6 and 13 respectively.

How is it as regards smallpox? At Homerton Hospital in 1871-77, 366 persons were employed. All but one were revaccinated, and she was the only one who took smallpox. In the Highgate Hospital the Royal Commission found that since May, 1883, of 137 nurses and attendants 30 had had smallpox before entering the service. Of the other 107 all except the gardener were revaccinated, and the gardener was the only one who took smallpox. In the Sheffield hospitals, in the year ending 31st March, 1888, there were treated 1,798 smallpox patients. The total number of attendants, etc., was 161. Of these, 18 had had smallpox previously and escaped attack; 63 had been vaccinated in infancy, of whom six were attacked and one died; the other 80 were successfully revaccinated, and not one contracted smallpox. In Leicester, however, where vaccination is neglected, some of the nurses refused revaccination. In the outbreak there in 1892-3 the total hospital staff consisted of 40 persons. Of these, 14 had either had smallpox or been revaccinated before the outbreak, and 20 were vaccinated owing to the outbreak. Among these 34 (14 and 20) one mild case occurred in a nurse whose revaccination was ten years old. Six of the 40 nurses appear to have been imbued with anti-vaccination opinions, and refused revaccination. Before the end of the epidemic, only one of the six needed any artificial protection against smallpox. Five of them took it and one died.

When smallpox again became epidemic in Leicester in 1903-4 the lesson of the previous outbreak had been learned by the hospital staff. The resident staff numbered 74 in the course of the two years. All (except three who had already had smallpox) had recently been vaccinated, and all escaped smallpox, though, as stated by the Medical Officer, the nurses were "steeped" in infection continuously. But two workmen, temporarily employed at the hospital, were not revaccinated, and, though never in the wards, both took smallpox.

The smallpox staff at the hospitals of the Metropolitan Asylums Board in the London epidemic of 1901-2 numbered 974, of whom 494 were nurses. Only two took smallpox, and one of these had not been revaccinated because she had had a previous attack of smallpox.

In Glasgow in 1903 the smallpox hospital was extended during an epidemic. Of 230 workmen employed for the purpose, 217 were successfully revaccinated,

and 13 refused, or were overlooked. Of the 217 not one took smallpox, and of the 13 five took it and one died.

Vaccinated Infants in Smallpox Hospitals.—Sometimes a mother suckling a vaccinated infant is attacked by smallpox, and, any other arrangement being impracticable, the child has to be sent to hospital along with the mother. It has, of course, been duly vaccinated before admission. A number of years ago during a prevalence of smallpox in the County of Stirling, two such children had to be sent to hospital under these circumstances and both escaped infection. In Dewsbury the same experience occurred on a larger scale. In Leicester the Medical Officer of Health took his own vaccinated children into the smallpox wards, where they were photographed amidst smallpox patients, the photographs being used for persuasion of contacts. The children were not infected.

Navy.—In illustration of its effects the following details may be given regarding the Navy, in which the practice of vaccination of recruits dates from 1864, and was extended to the whole service in 1871, excepting that until 1873 the rule did not apply to natives becoming members of the service abroad, nor to "foreigners," such as Kroomen. The statistics are partly from the Royal Commission's Report, and, for recent years, from information courteously given to me by the director-general of the medical department.

Year.	Attacks of Smallpox to every 10,000 of the Force.	Deaths from Smallpox to every 10,000 of the Force.	Year.	Attacks of Smallpox to every 10,000 of the Force.	Deaths from Smallpox to every 10,000 of the Force.
1860	51	3.9	1888	4	.2
1861	50	3.8	1889	1	.2
1862	17	3.1	1890	1	.4
1863	22	2.8	1891	3	0
1864	87	6.2	1892	2	.3
1865	32	2.9	1893	1	0
1866	48	1.6	1894	3	0
1867	49	2.7	1895	1.7	0
1868	16	.4	1896	1.5	.2
1869	17	1.0	1897	6.3	.2
1870	9	.2	1898	2.8	.2
1871	31	2.5	1899	1.6	.2
1872	19	2.3	1900	1.3	.1
1873	3	.2	1901	.9	.1
1874	2	.2	1902	1.4	.2
1875	4	.2	1903	.2	0
1876	5	1.3	1904	1	0
1877	4	0	1905	.18	.09
1878	2	0	1906	.55	0
1879	12	3.1	1907	.28	0
1880	2	.2	1908	.36	0
1881	6	.7	1909	0	0
1882	2	.5	1910	.08	0
1883	2	0	1911	.08	0
1884	1	0	1912	.25	.08
1885	1	0	1913	.39	0
1886	2	.6	1914	0	0
1887	.2	0	1915	.12	.04

Army.—In the General History of the War* it is explained that in January 1916 enlistment was authorised of men who declined to be vaccinated. In Mesopotamia a serious outbreak occurred among the forces, the total number of cases from December 1916 to October 1919 being 1908. "The disease did not make much headway until November, 1917, when, in consequence of the new regulations, many unprotected men had arrived in this country, and 152 cases were reported. In December of that year there were 337 cases. In September, October and November of the following year there was again a marked increase in the number of cases." (p. 444). "In two regiments affected by smallpox the combined strength was 1,749, of which 204 men were unprotected by efficient vaccination. There were 25 cases of smallpox with 5 deaths in the unprotected, and 5 cases with no deaths in the protected"—that is, 25 cases with 5 deaths in 204 unprotected, and 5 cases with no death in 1,545 protected.

"Taking the two regiments jointly the following are the particulars. Among 19 unvaccinated men there were 4 smallpox cases with 2 deaths. Among 83 vaccinated in infancy, but with no subsequent successful revaccination, there were 19 cases of smallpox with 3 deaths. Among 102 men vaccinated in infancy and revaccinated prior to 1913 there were 2 cases of smallpox and no deaths. Among 1,545 men vaccinated in infancy and successfully revaccinated in 1913 or at a subsequent date there were 5 cases of smallpox and no deaths." (p. 545).

Post Office Employees. The Royal Commission gave the following statistics as to smallpox among employees in the General Post Office where vaccination was required. Smallpox was prevalent in London in the period 1891-94 included in the table, and the Commission say: "It is noteworthy that, in the year 1892, 12 officers were absent from duty on account of the presence of smallpox in their houses; in 1893, 44; and in 1894 as many as 53."

Year.	GENERAL POST OFFICE.		
	Number of Established Officers employed.	Number of Cases of Smallpox.	Number of Deaths from Smallpox.
1891	47,264	None	None
1892	54,198	2	None
1893	58,311	4	None
1894	60,490	11	1

(5) Proportion of Vaccinated and Unvaccinated Attacked in Invaded Houses.

In houses invaded by smallpox in the course of an outbreak not nearly so many of the vaccinated inmates are attacked as of the unvaccinated in proportion to their numbers.

* Medical Services, Hygiene of the War, Vol. II, 1923.

The Royal Commission devoted attention to the facts and the following are the particulars relating to outbreaks in four towns.

	Incidence Rate under ten years of age.		Incidence Rate over ten years of age.	
	Vaccinated.	Unvaccinated.	Vaccinated.	Unvaccinated.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Warrington	4.4	54.5	29.9	57.6
Dewsbury.....	10.2	50.8	27.7	53.4
Leicester	2.5	35.3	22.2	47.6
Gloucester	8.8	46.3	32.2	50.0

Dewsbury, Leicester and Gloucester are selected here because they are centres of anti-vaccination, so that it cannot truthfully be alleged that the unvaccinated are weakly children whose vaccination has been postponed by medical certificate. The contention that the vaccinated and unvaccinated children belong to different classes is put out of court by making the comparison between the children in households actually invaded by the disease.

It is alleged by anti-vaccinationists that vaccination does not protect against smallpox, but on the contrary tends to weaken the system against all disease. Yet the vaccinated were attacked in much less proportion than the unvaccinated.

(6) Fatality among Vaccinated and Unvaccinated.

The fatality rate among persons attacked by smallpox is much greater, age for age, among the unvaccinated than among vaccinated.

In prevaccination days sometimes as many as 1 in 3 died, or even a greater proportion, and sometimes as few as 1 in 40. The London Smallpox Hospital had in 1746-63 a fatality rate of 25.3 per cent., and in the last 25 years of the century, 32 per cent. At that time, however, possibly the cases sent to hospital may have on the average been more severe than those treated at home. In some towns in Yorkshire, in certain years between 1720 and 1730, the fatality rate in about 18,000 cases was 16.5 per cent. The age of the persons attacked has a most important bearing on fatality, but hardly any prevaccination rates can be checked in this essential particular.

In the 10,403 cases treated in Homerton Hospital in 1873-84, the deaths among the vaccinated 8,234 were 869 or 10.5 per cent.; among the unvaccinated, 2,169, they were 938 or 43.4 per cent. We shall see shortly that the deaths among the well vaccinated were only 3 per cent. In the epidemics investigated by the Royal Commission in three towns, Dewsbury, Leicester, and Gloucester, where vaccination has been neglected, under 10 years of age, among 72 vaccinated children attacked, two died or 2.7 per cent.; but among 961 unvaccinated children attacked 350 died, or 37.3 per cent. Over 10 years of age, among 1,959 vaccinated persons attacked, there were 136 deaths or 6.9 per cent., and among 331 unvaccinated persons there were 75 deaths, or 22.6 per cent. Again it is to be noted that,

as vaccination was practically optional in these towns, the unvaccinated children, according to anti-vaccination theories, should have been more able to resist death by smallpox than those who had been subjected to an operation which is alleged to weaken the system and to render it more liable to disease and death.

In the London epidemic of 1901-2 there were treated in the hospitals of the Metropolitan Asylums Board, 9,659 cases of smallpox, of which 1,629 proved fatal. Among 6,945 vaccinated cases, including good, bad, and indifferent vaccinations, and including all ages, the deaths were 705, or 11.5 per cent. Among 2,278 unvaccinated cases the deaths were 753 or 33.1 per cent. Among the vaccinated only 134 were under 10 years old, and only 2 of these died, or 1.5 per cent. Among the unvaccinated 1,274 were under 10 years old, and 442 died, or 34.7 per cent. There were 436 doubtful cases where no vaccination marks could be seen, and the evidence as to vaccination was inconclusive, and of these 171 died; they may be added to either all-age group without materially altering the fatality rates.

The most recent experience supports the earlier. In 1922 in London there were, including the Poplar Workhouse outbreak, 65 cases. As recorded in the Report of Sir William Hamer, the Medical Officer of the London County Council, the facts relating to vaccination were as follows :—

The 65 cases were classed thus : (a) vaccination doubtful, 5 ; (b) unvaccinated, 14 ; (c) previously vaccinated, 46.

(a) Five showed no signs of vaccination, and it was doubtful whether it had been performed or not. Three died, two recovered.

(b) Of the 14 unvaccinated 7 died, 7 recovered.

(c) Of the 46 vaccinated in infancy, 10 died, 36 recovered. The three shortest intervals between primary vaccination and the attack were 14, 16 and 16 years respectively. The three shortest intervals between primary vaccination and a *fatal* attack were 43, 44 and 49 years respectively ; the ages of the other fatal cases vaccinated in infancy were 58, 66, 66, 67, 69, 72, 73 respectively.

(7) Protection Varies with the Efficiency of Vaccination.

The degree of protection conferred by vaccination corresponds to the thoroughness with which the operation has been performed, three or four marks being much better than one or two, and a large mark better than a small one.

In Dr. Gayton's 10,403 cases at the Homerton Hospital, 2,085 had good marks, and the fatality rate was 3 per cent.; 4,854 had indifferent marks, and the fatality rate was 9 per cent.; 1,295 were alleged to be vaccinated, but had no marks, and the fatality rate was 27 per cent.; and 2,169 were unvaccinated, and the fatality rate was 43 per cent. Taking "good" marks only, and attending to their numbers, Dr. Gayton found that with one mark the fatality rate was 4.1 per cent.; with two marks 3.3 per cent.; with three marks, 2.3 per cent.; with four or more marks, 1.5 per cent. The cases on which these percentages are founded numbered 529, 649, 518 and 389 respectively.

Dr. Gayton's table of cases is so instructive that it is reproduced here in full.

Ages.	Vaccinated Good Marks.			Vaccinated Imperfect Marks.			"Vaccinated," but no evidence of Vaccination.			Not Vaccinated.		
Years.	Cases.	Deaths.	Per Cent.	Cases.	Deaths	Per Cent.	Cases.	Deaths	Per Cent.	Cases.	Deaths.	Per Cent.
0-2	4	0	0	32	3	9	22	9	41	276	181	66
2-5	57	0	0	150	18	12	96	38	40	401	202	50
5-10	206	2	1	532	27	5	207	40	19	510	180	35
10-15	439	5	1	939	32	3	214	42	20	317	74	23
15-20	606	12	2	1037	66	6	205	39	19	204	86	42
20-25	389	11	3	843	100	13	167	56	34	174	83	48
25-30	189	12	6	529	80	15	116	35	30	105	56	53
30-40	147	14	10	526	78	15	137	49	36	103	42	41
40-50	29	4	14	186	33	18	85	24	28	49	21	43
50	19	2	11	80	18	22½	46	20	43	30	13	43
All ages	2085	62	3	4854	455	9	1295	352	27	2169	938	43

Taking 6,839 cases observed in more recent years, the Royal Commission found that the smallpox fatality rate in persons with one mark was 6.2 per cent.; with two marks, 5.8 per cent.; with three marks, 3.7 per cent.; and with four marks, 2.2 per cent.

A very notable contribution to the literature of smallpox and vaccination, based on Glasgow experience of the epidemic of the seventies, was made by Dr. J. B. Russell, then medical officer of that city.* A diagram included in his paper is reproduced here and tells its own tale (*see Appendix*).

Of patients with "good" marks, 3.81 per cent. died, and of patients with "bad" marks 21.1 per cent. The diagram shows:—(1) That "vaccination diminishes the original extent of the eruption"; (2) "That age has a slight influence in increasing the tendency to confluence in the natural disease"; (3) That "the influence of vaccination on the extent of the eruption diminishes as the age increases" (i.e., revaccination should be performed); and (4) That "the influence of a 'good' mark is very stable, and of a 'bad' mark very unstable."

Though revaccination occasionally leaves very faint scars, which almost disappear in time, yet the scars of primary vaccination are on any reasonable number of observations, very fairly indicative of the original areas of vesiculation, and are quite trustworthy for statistical purposes.

* A study of 972 cases of smallpox, *Glasgow Medical Journal*, Nov. 1872.

It is comparatively seldom that cases come to hospital with the smallpox eruption so far advanced and profuse as to obscure the vaccination marks, but in hospital statistics in this country, a column is often provided for "doubtful" cases, and if the figures for any large hospital be examined it will be seen that the inclusion of such cases either as "vaccinated" or "unvaccinated" does not alter the lesson taught by the statistics.

(8) The Protection Afforded by Infant Vaccination can be Renewed by Revaccination.

The value of revaccination has already been indicated in reference to the German nation and to the nurses and others engaged in work at smallpox hospitals.

The most striking illustration of the value of *recent* revaccination on a large scale in this country is to be found in the experience of Glasgow.

That city afforded in its smallpox epidemic of 1901-2 an exceptionally valuable field for observing the influence of revaccination. An epidemic of smallpox had begun at a time when the Corporation was promoting a great exhibition which would be ruined if the epidemic could not be stopped. The working-class population of Glasgow lives in huge tenement buildings, usually four storeys in height, with multiple dwellings on each flat, all entering from common passages and stairways. Opportunities for infection, therefore, are specially great. Belvidere Hospital, where Glasgow smallpox was then treated, is situated at the east end of the city, and, as often occurs in such circumstances, in the east-end population there was quite exceptional prevalence of smallpox. In these circumstances the Corporation offered systematic revaccination throughout the whole community over five years old. The total population over that age was estimated at 675,887, and the total cases of smallpox from the beginning of 1901 to May, 1902, were 1,858. The following table shows the progress both of vaccination and smallpox in this population fortnight by fortnight, those who accepted the Corporation's offer being distinguished from those who did not. The progress of revaccination is indicated by the figures, and the gradual extension of the practice until it had embraced over 400,000 persons is well seen in the table, along with the corresponding diminution in the numbers who neglected the protection offered them. From beginning to end it will be observed that smallpox absolutely confined itself to those who did not submit to the operation. Not a single recently revaccinated individual was attacked by the disease. There being most smallpox in the east-end, vaccination was most resorted to there.

Not recently Revaccinated and recently Revaccinated Population of Glasgow, over five years of age, in each Fortnight with the cases of smallpox occurring in each Class. (Dr. A. K. Chalmers).

		Not Recently Revaccinated.		Recently Revaccinated.	
		Population.	Cases Registered*	Population.	Cases Registered.
1901					
Jan.	12 ...	675,887	23	0	0
"	26 ...	674,816	350	1,071	0
Feb.	9 ...	671,025	202	4,862	0
"	23 ...	634,213	127	41,674	0
Mar.	9 ...	556,561	299	119,326	0
"	23 ...	518,426	161	157,461	0
April	6 ...	474,694	92	201,193	0
"	20 ...	429,056	67	246,831	0
May	4 ...	384,371	28	291,516	0
"	18 ...	366,125	18	309,762	0
June	1 ...	352,633	11	323,254	0
"	15 ...	347,777	2	328,110	0
"	29 ...	345,293	8	330,594	0
July	13 ...	281,867	1	394,020	0
Nov.	16 ...	279,452	1	396,435	0
"	30 ...	279,232	5	396,655	0
Dec.	14 ...	279,020	4	396,867	0
"	28 ...	278,796	0	397,091	0
1902					
Jan.	11 ...	278,623	28	397,264	0
"	25 ...	278,152	23	397,735	0
Feb.	8 ...	277,653	23	398,234	0
"	22 ...	277,134	147	398,753	0
Mar.	8 ...	276,033	92	399,854	0
"	22 ...	274,611	85	401,276	0
April	5 ...	272,694	36	403,193	0
"	19 ...	271,619	15	404,268	0
May	3 ...	271,032	10	404,855	0

The communities living in these great four-storied buildings were sharply differentiated by acceptances and refusal of vaccination, whilst the differentiation made by smallpox was equally sharp and equally definite. The two differentiations coincided throughout. The disease passed by the recently revaccinated and found all its victims among the unprotected population. It went from door to door like a rate collector taking his dues only from those who had not accepted offered relief. Another epidemic of smallpox broke out in Glasgow fully a year afterwards, and only one of the 400,000 revaccinated was attacked.

At p. 9, I stated that one of the most striking features of the case for vaccination is the convergence of different lines of evidence towards the one conclusion—that from whatever starting-place the subject be approached, the point reached is the same.

*The cases under five years have not been excluded from these figures, because their allocation through the various fortnights would have been difficult, and their inclusion is unimportant. In the 1900-1901 part of the outbreak these numbered 60, of whom 54 (including 30 cases occurring under one year) were unvaccinated primarily.

I have now submitted evidence to show that :—

- (1) The mortality from smallpox is much less now than in pre-vaccination times.
- (2) Where infant vaccination has been practised the greatest diminution in smallpox mortality has been in the early years of life.
- (3) In countries where there is much vaccination and revaccination, there is little smallpox.
- (4) In classes among which there is much vaccination and revaccination there is little smallpox.
- (5) In houses invaded by smallpox in the course of an outbreak not nearly so many of the vaccinated inmates are attacked as of the unvaccinated in proportion to their numbers.
- (6) The fatality rate among persons attacked by smallpox is much greater, age for age, among the unvaccinated than among vaccinated.
- (7) The degree of protection conferred by vaccination corresponds to the thoroughness with which the operation has been performed, three or four marks being much better than one or two, and a large mark much better than a small one.
- (8) The protection afforded by infant vaccination is renewed by revaccination.

I claim therefore to have proved my second proposition—that smallpox can be prevented by vaccination.

III. SMALLPOX CANNOT BE PREVENTED WITHOUT VACCINATION.

Smallpox may conceivably disappear from this country as leprosy has done, or be kept at bay like cholera. If it were to die out the need for vaccination and every ancillary preventive measure would, of course, die with it, to the great relief of all concerned. But the present subject is prevention and control, as to which two substitutes for vaccination have been suggested, one, hospital isolation and the other, sanitation. Both require notice.

(1) **Hospital Isolation.** The position here has to be clearly pointed out. If vaccination and revaccination were universal, smallpox hospitals would be needless. There would be practically no patients to put into them. If on the other hand, there were neither vaccination nor revaccination, if the whole population were unprotected, smallpox hospitals would be useless. Every case sent into them would be a centre of infection; the nurses and attendants would be attacked, and they would infect others in an ever-widening circle, unless, of course, they were protected by smallpox—and that would quickly become the position. But in the present condition, when there is still a very considerable amount of vaccination and revaccination in the country, and when vaccination can be resorted to at any time, smallpox hospitals are of great value. By surrounding the patient in such a hospital with a cordon of the vaccinated and revaccinated, spread of disease can be prevented, unless the hospital itself is situated in a centre of population where, as experience has shown, it is apt to become a centre of infection. By all means, therefore, let hospital isolation of smallpox be continued in spite of its heavy cost. It is part of the price that has to be paid for neglect of vaccination and revaccination, but is well worth paying, because isolation in existing conditions is invaluable.

In recent years hospital isolation of smallpox has been dilated on and advocated by opponents of vaccination as if it were a policy of their own invention. The fact is that the previous generation of antivaccinationists denounced isolation as violently as they denounced vaccination.

(2) **Sanitation.** In considering this suggestion analysis is needed. The term sanitation includes various measures. Smallpox is believed to be transmitted from case to case by inhalation of invisibly minute particles of the virus from the atmosphere, or by infected articles such as clothing, or by contact, or by other mediate conveyance. Pure water supply is a most important part of sanitation. Polluted water may convey enteric fever and cholera, but it is not a means of spread of smallpox. Milk is a vehicle for scarlet fever and diphtheria, but smallpox has never been known to be conveyed by milk. Shellfish and various articles of food have been proved to convey enteric fever, but again, not smallpox. Good drainage is an important part of sanitation, but smallpox has never been known to be carried by drainage. Chronic carriers play an important part in spreading enteric fever, but they have never been heard of in regard to smallpox or measles or whooping cough.

When we come to housing and fresh air and general cleanliness, however, the position is different. In Glasgow and Edinburgh and Dundee the great tenement buildings, several storeys high with multiple dwellings on every floor all reached by a common stairway, look as if they had been devised for the very purpose of spreading smallpox and other infectious diseases. A complete change in the system would undoubtedly tend to diminish the spread of epidemic smallpox. Fresh air and proper housing are indeed good against every disease to which flesh is heir, whether infectious or non-infectious. They are good in respect of every organ of the body—the lungs, the heart, the kidneys, the liver, and the brain. In their measure, therefore, they are good against smallpox. But they will not prevent it. Unless the individual is rendered immune he can be infected by smallpox in whatever kind of house he resides. Supposing you are standing some summer day on the pier at Southend on the Thames, or Rothesay on the Clyde, listening to a man elevated on a barrow at the pierhead, lecturing on the art of swimming, and supposing at the same time the man next you falls into the water and is in danger of drowning, you will not shout down to him to listen to the lecture on swimming. You will throw him a lifebelt. In respect of smallpox vaccination is the lifebelt—a present help and not merely a promise, while the subject of the lecture at the pier head may very properly be either housing or sanitation.

Any assertion that sanitation accounts for the results usually attributed to vaccination is contradicted by facts. Whooping cough and measles deaths still belong to childhood as in the last century, while smallpox deaths have been removed from vaccinated childhood to later periods of life. How could sanitation account for this differentiation?

In Germany, as we have seen, vaccination is not compulsory till the second year, and examination of the statistics for 1886-90 showed that over 40 per cent. of all the smallpox deaths were under two years of age. Is that to be explained by sanitation?

In a community attacked by smallpox how could sanitation at home protect postmen going from door to door day after day in infected districts?

In Leicester, how could sanitation account for the revaccinated nurses escaping smallpox, and the nurses who had refused revaccination taking smallpox?

How could sanitation cause smallpox to pass over vaccinated children and seize on unvaccinated children in houses invaded by smallpox in Dewsbury and Leicester and Gloucester?

How can sanitation have caused the fatality of smallpox cases to be much less among the vaccinated than among the unvaccinated in these towns, especially if vaccination weakens the system, and makes it less resistant to disease as is alleged by anti-vaccinationists?

How could sanitation cause children with three or four vaccination marks to have a smaller fatality from smallpox than children with one or two vaccination marks?

In Glasgow, while sanitation was going from bad to worse in the early part of last century, vaccination was introduced and smallpox underwent an enormous diminution, though hospitals and isolation and disinfection were entirely out of the question.

In Gloucester vaccination had been neglected, and in 1891 the Secretary to the Anti-vaccination League declared to the Royal Commission that Gloucester was a very clean town, and had always been well abreast of sanitary improvements, and that its death-rate was very low. The Board of Guardians also wrote to the Commission on the same lines. But smallpox came, and the town suffered from a terrible epidemic, after which the anti-vaccinationists declared that there had been a great want of sanitation in Gloucester. What was wanting was vaccination.

The Dewsbury Union was long triumphantly pointed to by anti-vaccinationists as a place which had learned to do without vaccination, and in great measure it also followed the old anti-vaccination creed that smallpox "is one of the least contagious diseases," and that cases should not be sent to hospital. Naturally, therefore, the Dewsbury Union has repeatedly had smallpox outbreaks and the epidemic cases had mounted to 1,302 by the end of 1904. Whilst the disease was rapidly spreading, the Guardians, led by an anti-vaccinist, still refused to carry out their duties under the Vaccination Acts, and in these circumstances the Local Government Board issued an Order empowering and requiring certain of the sanitary authorities, including the Dewsbury Town Council, to promote vaccination by the provision of every public facility for its performance. The Order was violently attacked by the *Vaccination Inquirer* and one or two London newspapers, but nevertheless it was vigorously applied, and whilom anti-vaccinists hurried to get vaccinated, so that smallpox rapidly declined, and in January, 1905, there were only 39 cases, in February, 2 cases, and in March, 1 case, the last of the outbreak.

(3) The Leicester Method.

Note.—The Address to Members of Parliament was published by the Research Defence Society (p. 7 ante). The *Lancet* reviewed it in a leading article on October 13th, 1923. Dr. C. Killick Millard, Medical Officer of Health of Leicester, contributed a critique of the Address to the *Lancet* of Feb. 9th, 1924. I replied in the issue of April 12th, and Dr. Millard wrote further in the *Lancet* of May 12th. In an appendix to my Milroy Lectures* I reproduced in full a criticism by Dr. Millard which had appeared in the *British Medical Journal*. The reader is referred to these, but as this pamphlet is itself designed to include information as to alleged alternatives to vaccination, discussion of the so-called Leicester Method as expounded by its advocates cannot be omitted.

* "Half a Century of Smallpox and Vaccination," published by R. & E. Livingstone, Edinburgh, 1919.

The usual anti-vaccination history of Leicester is that, prior to 1872, it was a well-vaccinated town, and that after having suffered from the pandemic of that time, it abandoned vaccination. The facts are very different. Before 1872 Leicester had been notorious for its neglect of vaccination, as appears, indeed, from statements made by exponents of Leicester's methods. In 1842 the guardians decided not to carry out the Vaccination Act of 1840, and in 1851 not half of the inhabitants were vaccinated. Lord Lyttleton, in introducing the Vaccination Act of 1853, cited Leicester as an example of neglected vaccination. A table of statistics of vaccination submitted to the Royal Commission by Mr. J. T. Biggs on behalf of Leicester showed a large average default excepting for the years 1868-71. The table has been reproduced without the explanation given by Mr. Biggs that for the years 1849-62 he had added 20 per cent. to the public vaccinations to represent private vaccinations, and in connexion with that erroneous reproduction a deficiency of about 30 per cent. is described merely as "a certain amount of vaccination default in Leicester" prior to 1868, which, it is said, "was also the case, no doubt, in most other towns." That statement is not in accordance with the facts. Neither is the further statement that "prior to the year 1871 Leicester ranked as a well-vaccinated town." Mr. Biggs wrote (Leicester: Sanitation v. Vaccination, p. 193) that "the epidemic of 1871-3 found a fully vaccinated population in Leicester, both infant and adult." In the years 1868-71 the percentage of vaccinations to births was as high as 87.7, but in respect of adults there is no excuse for Mr. Biggs's statement. As regards the period subsequent to 1872, at a census of the vaccinal condition of a typical population of over a thousand people, taken in 1903, it was found that about 62 per cent. had been vaccinated, though no doubt many of the vaccinations would be of old date.

Coming now to the "Leicester Method," and taking as its exponent, Mr. Biggs, the method as it existed, or rather as it professed to exist, is very different from that practised now.

Several points may be noted :

(a) The Method was "*without recourse to vaccination.*" (The italics are by Mr. Biggs).

(b) The Method was entirely voluntary; there was no compulsion.

(c) The same hospital was used for smallpox and all other infectious diseases at the same time.*

(d) The same hospital was also used for the (voluntary) quarantining of contacts.

(e) Compensation for loss of time (of contacts) was not offered.

The best feature has been that from the beginning, contacts seem to have been searched for carefully, and kept under surveillance. That is an important fact, creditable to the medical officers concerned. Houses and their contents were, of course, disinfected.

Every one of the items (a) to (e) has been given up.

(a) "Without recourse to vaccination." In saying that this item has been given up a reservation is necessary. The Method never was without recourse to vaccination, and that which never existed cannot be given up. But Mr. Biggs

*Also Mr. Biggs wrote: "We have one horse and one ambulance van which is kept for other diseases, whether there is any smallpox or not."—(*Vaccination Inquirer*, July 1st, 1891.)

says so with the emphasis of italics. He repeats the statement, and before the Royal Commission he says, "We have dealt with small-pox without vaccination" (Q. 15374), and he speaks of "the abandonment of vaccination." Dr. Millard uses the same phrase, "abandonment of vaccination." He writes that "Leicester, indeed, by abandoning vaccination, has performed a 'control' experiment of some value," and refers to the epidemics which have occurred "since vaccination has been abandoned" (*Public Health*, 1904, vol. xvi, p. 627). But there is an important difference. As he observes, "It is well to define our terms." When he says "vaccination was abandoned," he means "infantile vaccination as established by law in this country." It is in this way, by this special meaning for the word vaccination in this special connexion, that he is able to say, with Mr. Biggs, that Leicester has abandoned vaccination. He states the position rather differently again when he says that the method "professes to suffice for the control of smallpox without resort to universal vaccination." Referring to the vaccination census already mentioned, he stated in 1904 "that thirty-five per cent. were unvaccinated, chiefly children and young adults." This was the position twenty years after the so-called "abandonment" of vaccination. The Medical Officer of Health, in his report for 1902, wrote that "all three medical officers of health who have carried out the 'system' have been firm believers in vaccination and have not hesitated to make as full use of it as possible, short of compulsion, when the occasion for it has occurred." So that when he speaks of abandonment of vaccination he just does not mean abandonment of vaccination. But if the chairman of the Sanitary Committee of Leicester (Alderman Windley, who filled that office for forty years) was within even measurable distance of being correct in saying in 1887 that "only in a very rare instance was it (vaccination) done with consent of individuals by the ex-officer of health, Dr. Johnson, and that is so long since that he does not remember it," then there has been a vastly increased resort to vaccination, and the Leicester Method is not now in respect of vaccination what it was thirty or forty years ago. In 1903 there were 1,084 contacts, and it is to his credit that Dr. Millard induced nearly 800 of them living in infected houses to submit to vaccination.

The Leicester Method, in short, is *not* "without recourse to vaccination."

(b) Mr. Biggs declared before the epidemic of 1892-93:

We find smallpox very easy to deal with, and the same hospital and staff of officials deal with smallpox as with other infectious diseases. There is no compulsion. If people choose, they may go into quarantine, or they may stay out. No one's liberty is infringed.

There is nothing to show that removal to hospital is now any more optional in Leicester than in any other large town which possesses sufficient accommodation. That "no one's liberty is infringed" is only true if every case that is removed goes willingly—and it is unbelievable that its medical officer lets any patient fit for removal remain at home if the public is thereby endangered.

(c) The use of the same hospital for smallpox and all other infectious diseases was abandoned so early as before the end of 1892—that is, whenever smallpox became epidemic in the town, and less than two years after such use had been described as part of the Leicester Method. Not only was a separate small-pox hospital of sixty beds subsequently provided, but the whole of the ordinary hospital for infectious diseases was most prudently emptied of all other diseases and set apart for smallpox in the epidemic of 1903-4—the second since 1871-2—

and Dr. Millard being now medical officer of health. Dr. Joseph Priestley, medical officer of health, had acted in the same way in 1892-3. It was a wise precaution, but it was not the Leicester Method. In 1892-3, within two months of sending the scarlet fever cases home, whether or not owing to that dispersion, they doubled in number in the town.

(d) The quarantining of contacts at the hospital was abandoned in 1893, again when the town had to deal, not with a theory, but with a reality. Dr. Sidney Coupland says, in reporting to the Royal Commission (Appendix VI, p. 3): "It is not, therefore, to be wondered at that the sanitary authority was led to abandon this essential feature of the plan known as the 'Leicester System,' and to substitute for it the generally adopted practice of maintaining infected families under supervision in their houses during the 'quarantine period' of sixteen days."

(e) With regard to compensation for loss of time not being offered to contacts, when such compensation was recommended by the Royal Commission on Vaccination, Dr. Millard declared that "it marks the approval of the Royal Commission of one of the special features of the 'Leicester Method'." I would not myself have regarded (e) as of first-class importance, but as Dr. Millard holds it to be a "special feature" it is only fair to include it in the list. Mr. Biggs, however, said to the Royal Commission: "I think there is sufficient evidence to prove that no compensation has been made in the shape of wages, and that all that has been done in carrying out our system has been to reimburse those whose articles of furniture have been destroyed." The Leicester Method has in this respect, therefore, been reversed, and the reversed practice is now claimed by Dr. Millard as distinctive of the Method.

Indeed, it is not vaccination, but the Leicester Method in most of its features, which has been abandoned in Leicester. At the same time, smallpox has in the present day become in this country a less fatal, a less infectious, and a less prevalent disease than when the Method was propounded. Under these circumstances, Leicester had only 355 cases of smallpox in the epidemic of 1892-93 and 715 notifications in 1903-4*, and thus furnishes useful illustration of the fact that, with the mild type of smallpox which prevailed in the provinces in these two epidemics, the modern method, which Leicester had adopted before that time instead of its own Method, can achieve some measure of success even in a town where there is a large unvaccinated population, and where pressure towards recent vaccination is applied only to contacts.

IV. PROPERLY CONDUCTED VACCINATION IS VERY SAFE.

The chief danger feared a generation ago was that syphilis might be conveyed by arm-to-arm vaccination, and Jonathan Hutchinson proved that certain cases of vaccino-syphilis had really occurred, though most rarely in this country. That, however, did not shake Hutchinson's conviction of the necessity for vaccination, and medical men were not in the least afraid to vaccinate their own children from the same arms which they used for their patients. Now, with calf lymph there is no possibility of syphilis, because calves are not subject to that disease. As to tuberculosis or other supposed risks, before any lymph is distributed for use, the animal from which it is derived has been slaughtered and its body subjected to a careful examination, the lymph being destroyed if there is the slightest cause for doubt as to its purity. The treatment of lymph by

* Dr. Millard says that in 1903 there must in addition have been many unnotified cases.

glycerine or otherwise as practised in the Government Laboratories is most valuable in the elimination of pathogenic organisms. Vaccine produced in this way is as safe as science can make it.

But nothing in the world is absolutely safe. A scratch of a pin may open the door to erysipelas or lockjaw. The bite of an insect may be fatal, and the vaccine vesicle on the arm may become infected septicly or by erysipelas as in the case of any other wound. Such accidents, however rare, are most deplorable, and even if they are due to the fault of an incompetent or careless mother, there cannot but be the deepest sympathy for her baby and herself.

If all deaths in the certification of which any mention whatever is made of vaccination, be debited to the operations of the public vaccinators, and none to vaccinations by private practitioners, there will be found in the years for which the figures are available since 1911, one death to over 32,000 operations. But only about two-thirds of registered vaccinations are done by public vaccinators, and taking that into account there would appear to be one death in about 48,000 operations. The deaths which go to make up this proportion include cases where certificates state, in addition to vaccination, causes like measles or bronchitis or pneumonia, but the tradition of the Register Office has been to place all such in the category of "Cowpox and other effects of vaccination."* Forty years ago such registrations were much more numerous than now in proportion to the vaccinations, notwithstanding the much advertised case of one doctor who declared that to save vaccination from reproach he omitted reference to it in certifying erysipelas after vaccination. But however small the residuum be, it is obviously of the utmost importance that every effort be made to prevent any kind of mismanagement of the vaccination vesicle. It is well worth consideration whether public vaccinators should not systematically instruct by the issue of a printed card in each case, as to the protection of the vesicle, and whether also the local health visitor or district nurse should not regularly receive a list of babies under vaccination, so that she may pay a visit to cases when making her rounds in the poorer areas of her district.

Owing to occurrences in the United States, reference has recently been made to tetanus as an infection capable of introduction by vaccination. But Dr. E. D. Acland, who reported on vaccinal injuries to the Royal Commission, stated that in more than five million vaccinations in this country he could find only one death from tetanus, and there was no proof of causal relationship. Also the books in which all cases of alleged vaccinal deaths are entered at the Registrar-General's office have been searched back to 1895, and they contain not a single mention of tetanus.

THE FUTURE OF SMALLPOX AND VACCINATION.

Medical men convinced by education and experience of the value of vaccination and having occasion to state the grounds of their belief, ought to make themselves aware of what may be argued in opposition to their convictions. In illustration I reproduce in full a leaflet recently issued by the Anti-Vaccination League.

* This practice has now been modified in order to comply with the international classification of deaths, of which the object is to secure uniformity of registration as between nations. It appears that in other countries, whether erysipelas follows the scratch of a pin or an insect bite or a vaccine vesicle, the death is entered as due to erysipelas, and not under the heading of the trivial injury through which the infection found entrance. In adopting the international system therefore, a similar entry is now made in the registrations in England. But, in addition, to avoid (if that were possible) any charge of concealment of vaccinal injuries, the Registrar-General in his Annual Report makes a statement of all such cases.

ENGLAND AND WALES.

Percentage of Births Vaccinated and Number of Smallpox Deaths Registered.

(See answer in Parliament, July 16th, 1923.)

1872-1881			1882-1891			1892-1901			1902-1911			1912-1921		
% of Births Vacc. S'pox Deaths			% of Births Vacc. S'pox Deaths			% of Births Vacc. S'pox Deaths			% of Births Vacc. S'pox Deaths			% of Births Vacc. S'pox Deaths		
1872	85.0	19,022	1882	85.9	1,317	1892	74.5	431	1902	74.8	2,464	1912	50.1	9
1873	85.2	2,303	1883	85.6	957	1893	72.3	1,457	1903	75.4	760	1913	46.5	10
1874	85.05	2,084	1884	84.4	2,234	1894	70.4	820	1904	75.3	507	1914	44.6	4
1875	84.9	849	1885	84.7	2,827	1895	67.8	223	1905	75.8	116	1915	45.5	13
1876	86.0	2,408	1886	83.4	275	1896	66.0	541	1906	73.4	21	1916	44.7	18
1877	86.3	4,278	1887	82.8	506	1897	62.4	25	1907	70.9	10	1917	43.3	3
1878	85.3	1,856	1888	81.7	1,026	1898	61.0	253	1908	63.2	12	1918	41.5	2
1879	86.0	536	1889	79.8	23	1899	66.4	174	1909	59.8	21	1919	40.6	28
1880	85.1	648	1890	78.0	16	1900	68.7	85	1910	55.9	19	1920	39.5	30
1881	86.6	3,098	1891	75.8	49	1901	71.4	356	1911	52.3	23	1921	38.3	5
Totals .. 37,082			9,230			4,365			3,953			122		
Average per annum:														
85.5 3,708			82.1 923			67.9 436			67.6 395			43.4 12		

So in the 10 years 1872-1881, when an average of 85.5% of the births were vaccinated, we had an average of 3,708 Smallpox deaths every year. In 1882-1891, when an average of 82.1% of the births were vaccinated, we had an average of 923 Smallpox deaths every year. In 1892-1901, when the vaccinations had declined to an average of 67.9% of the births, the Smallpox deaths dropped to an average of 436 per annum. In 1902-1911, when the average number of vaccinations was 67.6% of the births, the Smallpox deaths averaged 395 per annum, but in 1912-1921, when the vaccinations had dropped to 43.4% of the births, there was an average of only 12 Smallpox deaths per annum. How can any person who claims to understand statistics and to have a logical brain declare that it is vaccination that has stamped out Smallpox, in face of the above official figures?

The period covered by the Table begins with 1872. It is shown how in the first year of the fifty embraced in the table, 85 per cent. of the births were vaccinated and there were 19,022 deaths from smallpox, whereas in the last year, only 38.3 per cent. of births were vaccinated, and there were only five deaths from smallpox. The year 1872 was that in which the pandemic following the Franco-German war reached its height, but silence is maintained on that point. On the other hand, as regards recent years two essential facts are, first the change in type of smallpox, and second, the change in the vaccination law, both in its terms and in its administration. Fatality rates—the proportions of deaths to cases—have wonderfully diminished, the diminution having begun observably so long as about 35 years ago. Also, and very important, under the present law—the Act of 1907—exemption from vaccination has been procurable without trouble or difficulty. The country thus passing through a period of unprecedented freedom from smallpox and the fatality rate being very much lower than for a century before, it is not in the least surprising that vaccination of infants has been greatly neglected. But cause and effect must not be confused. Vaccinations have diminished because smallpox has diminished, and whenever and wherever smallpox becomes again prevalent, vaccinations will increase. In fact it will always be possible, vaccination being voluntary, to show in parallel columns much vaccination and much smallpox, little vaccination and little smallpox.

Anyone who chooses could argue for example that in Glasgow in 1901-2 (p. 19 ante), there were not only the usual infant vaccinations but also over 400,000 revaccinations yet there were over 1,800 cases of smallpox. But when vaccinations diminish, smallpox also diminishes, and if next year there were, say, ten thousand cases of smallpox of the old type, there would be hundreds of thousands of vaccinations and revaccinations.

In so far as vaccination is carried on when smallpox prevalence and fatality are at a low ebb, it is an insurance against future risk, so that the rare accident of a death in any way related to vaccination is not to be measured against current deaths from smallpox, but against what is to be encountered when smallpox reappears. A prudent man does not fail to renew his fire insurance premium because last year his house had not been burned down.

What the future has in store in respect of smallpox no human being can say. The records of the disease in this country go back for a thousand years, but after the epidemic in the first quinquennium of the present century, England enjoyed for a dozen years such unparalleled freedom from smallpox as almost to suggest the possibility that at long length it was approaching extinction in the British Isles. Since then, however, there has been an ominous and progressive recrudescence, though only of a much modified strain of the infection. Notifications for 1917-23 have been as follows:—

Year	1917	1918	1919	1920	1921	1922	1923
Notifications	7	63	311	280	336	973	2504

In the first 26 weeks of 1924 there have been 2,178 cases.

The Question of Compulsion.

Despite more or less successful local efforts to stamp out smallpox by control of contacts, by hospital isolation of cases, by disinfection, and by vaccination of those who care to accept protection, the infection, in the absence of general vaccination and revaccination persists in some of the affected areas, and has succeeded in invading others. At the same time the mild form of the disease does not cause and cannot cause that wide resort to vaccination and revaccination which accompanied previous epidemics.

In these circumstances it is not surprising that demands have been made by many local authorities, by part of the public, by some members of the medical profession, and by newspapers, for a return to so-called "compulsory" vaccination. On that question some observations may be made. The term compulsory as applied to the Vaccination Acts has a merely technical significance. Vaccination in this country never has been compulsory. The law has never sanctioned the taking of an infant from its mother's arms and forcibly vaccinating it. Fines have been imposed, single or repeated, and failure to pay fines in this or other matters sometimes has involved seizure of goods, or rarely imprisonment, but even these means have failed, as the Leicester Guardians discovered long ago, and, in short, there has been no actual compulsion. That has been the position even in Germany, where, however, the law has been applied not only to primary, but to revaccination, and where the public have been more law-abiding than in this

country. But in my view, and as urged a quarter of a century ago, in an address at a congress of the Sanitary Institute (in 1898)—before the present era of mild smallpox had begun—the question of the law of vaccination is for the legislature, not for the medical profession. As doctors, our duty is to instruct the public and parliament in the value of vaccination and to leave to parliament the question of what degree of statutory pressure should be exercised in support of it. As a citizen, I am convinced that abolition of exemption from vaccination would be mischievous by leading to resistance on the part of eccentrics who genuinely object to it, and also by tempting mere publicity hunters to strive for the glories of cheap martyrdom. Even the most enthusiastic compulsionist must surely realise that so long as smallpox retains the exceedingly mild type which characterises it at present, efforts to introduce compulsion would be more than ever hopeless. But the Act of 1907 in its administration has involved a practical invitation to parents to omit the vaccination of their children, and it is satisfactory that that invitation has now been administratively withdrawn.* As I said in addressing members of the House of Commons, if parliament disbelieves in vaccination it should repeal the Acts. If it believes in vaccination it should exercise some degree of pressure in support of its belief, not by attempts at compulsion which would do far more harm than good, but by drawing some practical distinction between a parent no doubt wrongheaded yet sincere in his conviction that vaccination is evil, and another parent who is merely indifferent or neglectful.

Even the 38 per cent. of infant vaccinations in 1921, and the 40 per cent. in 1922,† together with vaccinations and revaccinations of men and women during the war, and the vaccinations in localities invaded by smallpox since the recrudescence of the disease, together diminish greatly the population liable to smallpox in the country as a whole. And if smallpox of the old sort returns, as it may at any time, then the facilities for rapid production of calf lymph should quickly meet the most extensive demand. There are, of course, obvious drawbacks to such a system. Smallpox will take its toll of attacks and deaths before the public realises the position, and “bad arms” will be commoner than if the work could be carried out under conditions of leisure, both of vaccinator and vaccinee. On the other hand the protection obtained will have all the advantage of recency, as exemplified in the Glasgow revaccination crusade of 1901-2.

Smallpox in Canada. The Stamping-out Method in Action.

Here is an illustration, just come to hand, of what may be accomplished without legislative compulsion, when smallpox of virulent type appears in a community, and when concerted action is taken to meet the danger. The story is told in the *British Medical Journal* of July 19th, 1924, and is quoted in full:

SMALLPOX IN CANADA.

The Stamping-out Method in Action.

The *British Medical Journal* of March 29th of this year (p. 584) reproduced a circular issued by Dr. John W. S. McCullough, chief officer to the Provincial Board of Health of Ontario, on the subject of an epidemic of very severe smallpox—in many cases hæmorrhagic—in the border cities of Canada. The disease was still current at the date of that circular. The story has now been completed in a report by Dr. F. Adams, D.P.H., medical officer of

* Since this was written it has been restored.

† In Scotland the 62 per cent.

health for the Essex Border Municipalities. The total number of cases was only 67. Of 45 who had never been successfully vaccinated, 32 died. Of 10 who had been successfully vaccinated years before, and of 12 others successfully vaccinated in the incubation period, all recovered.

The extraordinary severity of the disease—not its mildness, as in this country at present—made diagnosis exceedingly difficult, and the story of the manner in which it was stamped out is graphically told by Dr. Adams. There are six border cities, and their combined population is about 70,000. The Board of Health is composed wholly of doctors, each of whom had been at some time a medical officer of health. When the danger became apparent to them they met on a Saturday night, and first of all provided for the care of the sick and the maintenance and supervision of families in quarantine. Being unanimously of opinion that the one thing which would stamp out the epidemic was wholesale vaccination, they proceeded as follows :

“ Then and there three of our nurses using three 'phone lines called up every doctor in the Border Cities that could be reached, and asked him if in the emergency he would consent to vaccinate any person who came to his office free of charge, it being understood that the Board of Health would supply vaccine and pay for vaccinations at the rate of 25 cents apiece. Within half an hour we had the consent of about three-fourths of our doctors. The rest could not be reached, but we assumed their consent and telephoned them Sunday morning. Before midnight a statement of the situation was prepared and sent out to every clergyman in the Border Cities, with a request that it be read from the pulpit at every service on Sunday. The gist of the announcement was that an epidemic of exceedingly severe smallpox was present in the Border Cities, that there had already been a number of deaths, and that everyone was advised to be vaccinated at once and to have all the members of his household vaccinated ; finally, that arrangements had been made with every doctor in the Border Cities under which he would vaccinate anyone who came to his office free of charge. On Sunday, at our request, the secretary of the Chamber of Commerce called up every large employer of labour in the Border Cities, explained the situation to him, and asked him to urge vaccination upon all his employees Monday morning. Monday afternoon a full-page advertisement of the Board of Health, setting forth the situation, appeared in the local paper. The effect of these measures was all that we could have asked for. There are some seventy doctors in the Border Cities, and we had simply created seventy free vaccination stations. The doctors' offices began to be crowded with applicants for vaccination on Sunday morning, and within the next six days we estimate that well over 95 per cent. of our population was vaccinated. There was nothing compulsory about any of our methods. We simply took the public into our confidence, told them the situation as it really was, advised general vaccination, and made provision for it without charge. The antivaccinationist, usually so noisy and troublesome, gave us no trouble at all. As far as checking the epidemic was concerned, the effect of these measures was a hundred per cent. perfect. We had one big splash of cases and then silence, and that silence has continued without interruption right up to the present moment—almost three months.”

Dr. Adams's report as to the smallpox cases is not confined to statistics, but contains many details of human interest. Here are some of them :

“ In Windsor there is a family named M., consisting of ten persons. All of them were exposed to smallpox and about equally. Nine of them had been vaccinated successfully in previous years and none of these contracted smallpox. The tenth person had never been vaccinated, contracted the disease and died inside of four days of the hæmorrhagic lobster rash type of smallpox.

“ During the epidemic we had to employ a large number of nurses to look after the sick and we had also to expose to the disease orderlies, ambulance drivers, clergymen, and others. We made it an absolute rule that no one should be exposed to smallpox through our action unless that person had a vaccination scar already and was also freshly vaccinated by us. The result of this precaution was that not a single person who was exposed to the disease through any action on our part came down with smallpox.

“ Of course, when a case of smallpox developed in a household we vaccinated every other person in the house. Contacts of this kind, which in Maidstone, Amherstburg, and the Border Cities run into the hundreds—all, as far as I know, escaped smallpox as a consequence of timely vaccination.

" Mrs. J. D., of Walkerville, 52 years of age, never vaccinated, developed smallpox and died after an illness of eight days. Her husband, with a history of exposure many times in excess of that of his wife, had a trifling attack of smallpox. He had been successfully vaccinated twelve years ago.

" The proprietor of a laundry came down sick with smallpox, and on investigation it was found that out of a total staff of twenty-five persons at the laundry he alone was unvaccinated, and he was the only one who contracted the disease.

" A. D., aged 50, and his son R.D., aged 25, neither having been successfully vaccinated, died of smallpox. Mrs. A. D., vaccinated successfully thirty-two years before, took smallpox also, but it was a trifling illness.

" G. D., the man who had the original illness that was smallpox but was not diagnosed as such, had a daughter Josephine, 12 years old. She was exposed to her father through the whole course of sickness and later on to her mother and aunt, who developed smallpox, *but she has not had one single day's illness herself.* Six years ago she was vaccinated to go to school, and she has on her left arm a scar about the size of an old-fashioned Canadian five-cent piece. Twenty-one close relatives of this little girl, all unvaccinated, are dead of smallpox."

Dr. Adams concludes as follows :

" It is when one has had close personal experience with incidents such as these, when one has had to send nurses by the dozen up against the most virulent smallpox with nothing to protect them except vaccination, and they nurse the disease week in and week out without contracting it, when one has seen a community of thousands of persons threatened with decimation by smallpox and one has seen wholesale vaccination pull the disease up short and weeks and weeks go by without any fresh cases at all, then and then only does one fully appreciate the marvellous gift which Jenner made to science and to humanity."

Dr. Adams and his colleagues of the Border Cities Board of Health are to be congratulated on their triumph over virulent smallpox ; so also are the clergymen who intimated the position from the pulpit, the employers and employees and the public generally who accepted the advice that was given them, and the seventy doctors who vaccinated, as estimated, over 95 per cent. of the population within a week. Under the same measures the same result can be achieved to-day in respect of the mild smallpox which continues to prevail in Middlesbrough, Chesterfield, Derby, and wherever else the disease exists in Britain.

Having reproduced this story to show what can be done when smallpox itself undertakes the function of a teacher of vaccination, let me protest most strongly against any proposal that the medical profession should interfere in the direction of relaxing still further the pressure towards vaccination exercised under the Act of 1907. The confessed object is to diminish still further the 40 per cent. of vaccinations to births in 1922, so that smallpox attack may be on the whole more severe and less likely to be overlooked, the ultimate aim being to protect against exposure to infection those who have not been vaccinated, whether through opposition or neglect. Such a scheme of vicarious sacrifice seems to me so utterly self-condemnatory as to require no criticism.

Whatever the law may be in the future, the fact remains unquestionable by any man capable of drawing conclusions from evidence, that vaccination, renewed as circumstances may require, does prevent smallpox, and that smallpox as we know it cannot be prevented without its aid. Any parent who pleases can protect himself and his children from smallpox whether mild or severe, and need have no anxiety in the midst of the most severe and fatal epidemic, or of the most insidious form of attenuated infection in which smallpox can manifest itself. On its side the medical profession, teaching the truth about vaccination need have no anxiety about the strength and soundness of its *own* position. Whatever happens its withers will be unwrung.

BIBLIOGRAPHY.

Various references to authorities appear in the pamphlet, but it will be convenient to state here some sources of information which may be consulted by a reader wishing to follow the subject further :

- (1) Papers relating to the History and Practice of Vaccination, by Sir John Simon, 1857. Reprinted in great part as an Appendix to the First Report of the Royal Commission on Vaccination.
- (2) Reports of the Royal Commission on Vaccination, 1889-97. The Final Report, with a Statement of Dissent by two of the Commissioners, was also issued by the New Sydenham Society in 1898.
- (3) Annual Reports of the Medical Department of the Local Government Board. The Report for 1884 deals specially with Smallpox and Vaccination. The Report for 1903-4 contains Dr. R. Bruce Low's Report on German Arrangements for Isolation of Smallpox.
- (4) The Ministry of Health's Tract on Smallpox and Vaccination. Price 3d. Stationery Office, 1921.
- (5) Reports by the Medical Officer of the London County Council, 1900-1, 1922, 1923, and other years.
- (6) Reports of the Metropolitan Asylums Board. The Report for 1901-2 deals with the epidemic of that year.
- (7) Report of the Select Committee of the House of Commons on the Vaccination, 1867 (Parliamentary Paper No. 246, Session 1871.)
- (8) Dr. F. W. Barry's Report on Sheffield Smallpox Epidemic, 1887-8. (Parliamentary Paper C. 5645, Session 1889.)
- (9) Dr. S. Monckton Copeman, F.R.S. Vaccination, its Natural History and Pathology. Milroy Lectures, 1899. MacMillan & Co.
- (10) Dr. R. D. Sweeting. The Report of the German Imperial Health Commission. *Practitioner*, November, 1892.
- (11) Dr. A. K. Chalmers. Report on Smallpox Epidemic in Glasgow, 1900-2. Issued by the Corporation.
- (12) Dr. E. J. Edwardes. A Concise History of Smallpox and Vaccination in Europe. H. K. Lewis, 1902.
- (14) *British Medical Journal*. Jenner number, 1896, and Vaccination number, 1902.
- (15) The Gloucester Epidemic of Smallpox. *The Lancet*, Feb.-March, 1898.
- (16) *Public Health*. The Jenner number, May, 1896.
- (17) Dr. C. Killick Millard's Leicester Reports, 1902-4; articles in *Public Health*, 1902, 1904, 1917, etc.; The Vaccination Question. H. K. Lewis, 1914.
- (18) Dr. John C. McVail: (a) Smallpox in Kilmarnock in the Eighteenth Century (*Trans. Phil. Soc.*, Glasgow, 1882, and Fourteenth Report of the Medical Officer of the English Local Government Board, 1884); (b) *Vaccination Vindicated* (Cassell & Co., 1887) (c) Dr. Creighton on Vaccination. A Review (*Edinburgh Medical Journal*, 1889-90, and Jenner Society's publications); (d) Evidence before the Royal Commission on Vaccination, 1892-3 (Sixth Report of the Commission, pp. 256-362); (e) Smallpox and Vaccination (Stevenson & Murphy's *Treatise on Hygiene*, vol. ii., Churchill's, 1893); (f) The Aerial Convection of Smallpox from Hospitals (*Trans. Epidem. Soc.*, vol. xiii., 1894); (g) Cowpox and Smallpox—Jenner, Woodville and Pearson (Jenner Centenary Number of the *British Medical Journal*, vol. i., 1896); (h) Sanitation or Vaccination. A Glasgow Study (*Public Health*, 1896); (i) The Vaccination Laws (*Lancet*, 1896, vol. i., p. 1417); (j) Leicester and Smallpox (*Lancet*, vol. ii., 1897); (k) A Review of the Statement of Dissent from the Report of the Royal Commission on Vaccination (*Trans. Epidem. Soc.*, vol. xvi., 1897); (l) Gloucester and Smallpox (*Lancet*, vol. i., 1898); (m) Vaccination as a Branch of Preventive Medicine (Allbutt & Rolleston's *System of Medicine*, vol. ii., 2nd edition, 1906,

Macmillan); (n) Vaccination and the Control of Smallpox (*The Practitioner's Encyclopædia of Medicine and Surgery*, 2nd edition, Oxford Medical Publications, 1913); (o) Half a Century of Smallpox and Vaccination (Milroy Lectures, 1919, Edinburgh, E. & S. Livingstone).

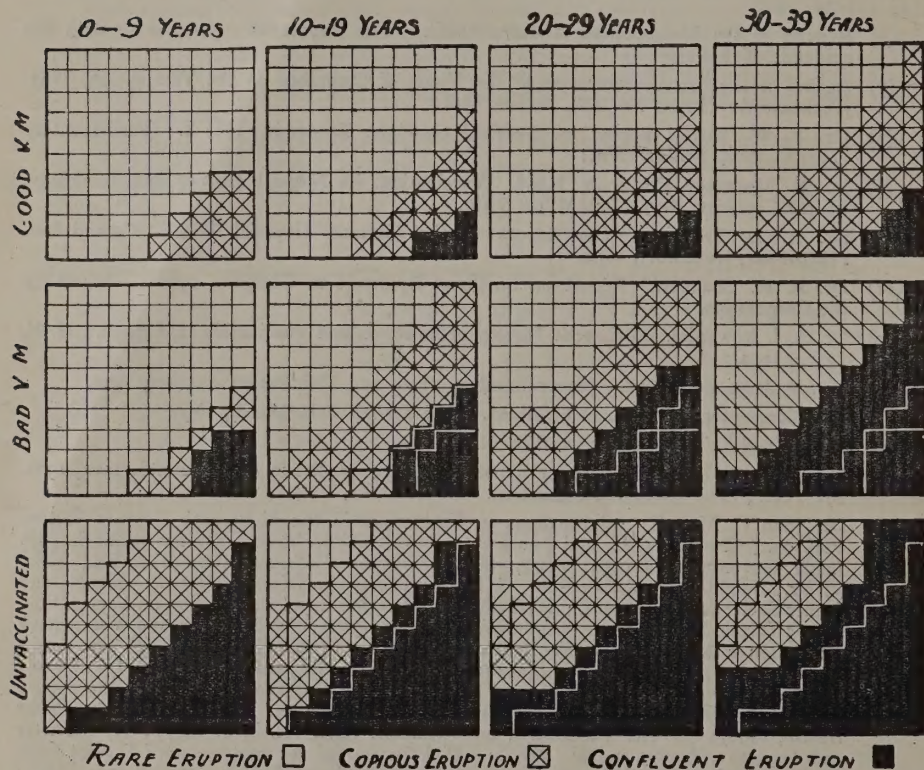
ANTI-VACCINATION WORKS.

- (19) Dr. Chas. Creighton: (a) *The Natural History of Cowpox and Vaccinal Syphilis*, Cassell & Co., 1887; (b) *Jenner and Vaccination* (Swan, Sonnenschien & Co., 1887); (c) Article on Vaccination in 9th edition *Encyclopædia Britannica*.
- (20) Prof. Edgar M. Crookshank, *History and Pathology of Vaccination* (H. K. Lewis, 1889).
- (21) Dr. W. S. Tebb, *A Century of Vaccination* (Swan, Sonnenschein & Co., 1898).

A note of many old works on Smallpox and Smallpox Inoculation will be found at p. 804 of (m) in No. 18 of the above list.

APPENDIX.

DIAGRAM BY DR. J. B. RUSSELL.



The large squares contain 100 smaller ones, so that the varieties of the smaller squares represent percentages ("V.M." means vaccination marks. The thicker black-and-white lines indicate the original percentages at 0-9 years.)

